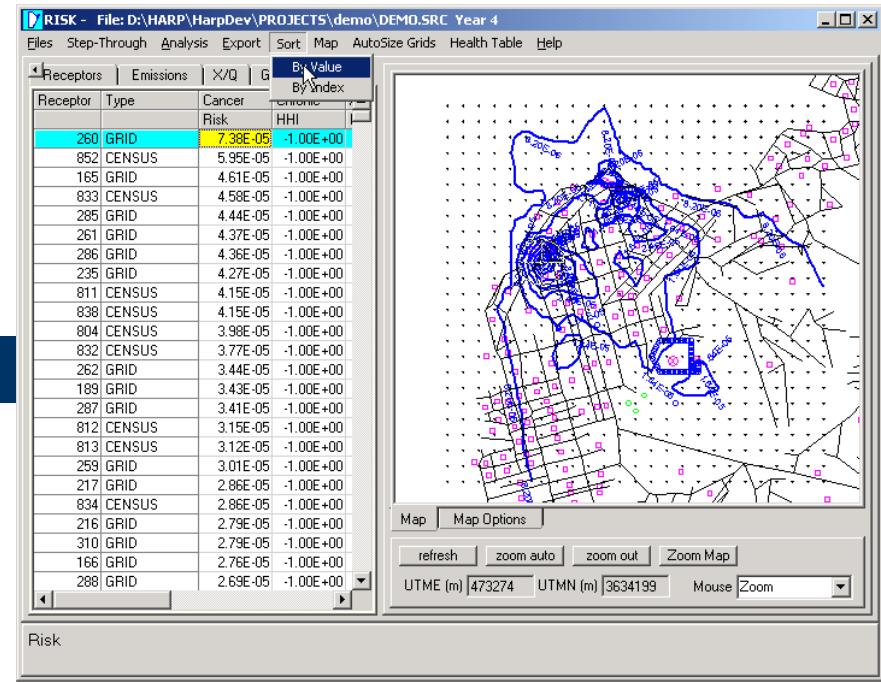


# HARP

## (Hotspots Analysis and Reporting Program)

**Presented to:**  
**USEPA Region 5**  
**July 17, 2003**

**Presented by:**  
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# Agenda



- Background
- Program Organization
- Data Entry and Management
- Reporting
- Dispersion Analysis
- Risk Analysis



# Background

# What is HARP?



“Hot Spots Analysis and Reporting Program”

HARP integrates all of the data management, dispersion and risk analysis functions required for statewide air quality management into a single windows-based program.

# Background



- Project initiation
  - Initiated in July 1995 in support of Assembly Bill 2588, Air Toxics “Hot Spots” Information and Assessment Act
- Release schedule
  - **Database management module** completed and deployed in June 1996
  - **Risk analysis module** developed (1999-present) in parallel with development of risk analysis guidelines by Office of Environmental Health Hazard Assessment (OEHHA)
  - **Public release** expected summer of 2003
- Funding/Sponsor
  - Funded by California Air Resources Board (CARB)
- Contractor
  - Software designed and written by Dillingham Software Engineering, Inc. (DSE)
- Deployment
  - Expected summer of 2003

# Project Objectives



- Uniform data reporting
  - Standardize reporting of emissions data state-wide
- Electronic data exchange
  - Transmit emissions data to/from CARB and districts
- Compatibility with CEIDARS database
  - Wimilar to RAPIDS and NEI
- Standardize analysis
  - Standardize emission inventory, dispersion and risk analysis by integration into one program
  - Strict compliance with OEHHA guidelines for risk analysis methodology (similar to HHRAP)
- Royalty-free distribution
  - Software will be available at little or no cost, including public domain street maps, census data and terrain elevation data
- Turn-key system
  - Includes everything for data reporting, dispersion analysis, risk analysis, GIS. No third-party software required.



# HARP Program Organization

# Four Flavors of HARP

## HARP Desktop/Framework

emissions inventory database, dispersion analysis, risk analysis, integrated GIS; framework libraries

**RISK - File: D:\HARP\Harp.rdb**

File Step-Through Analysis Export

Receptors Emissions X/Q G By Value By Index

Receptor	Type	Cancer	Noncancer
260 GRID		7.38E-05	1.00E+00
852 CENSUS		5.95E-05	-1.00E+00
165 GRID		4.61E-05	-1.00E+00
833 CENSUS		4.58E-05	-1.00E+00
285 GRID		4.44E-05	-1.00E+00
261 GRID		4.37E-05	-1.00E+00
286 GRID		4.36E-05	-1.00E+00
235 GRID		4.27E-05	-1.00E+00
811 CENSUS		4.15E-05	-1.00E+00
838 CENSUS		4.15E-05	-1.00E+00
804 CENSUS		3.98E-05	-1.00E+00
832 CENSUS		3.77E-05	-1.00E+00
262 GRID		3.44E-05	-1.00E+00
189 GRID		3.43E-05	-1.00E+00
287 GRID		3.41E-05	-1.00E+00
812 CENSUS		3.15E-05	-1.00E+00
813 CENSUS		3.12E-05	-1.00E+00
259 GRID		3.01E-05	-1.00E+00
217 GRID		2.86E-05	1.1
834 CENSUS		2.86E-05	1.1
216 GRID		2.79E-05	1.1
310 GRID		2.79E-05	1.1
166 GRID		2.76E-05	1.1
288 GRID		2.69E-05	1.1

**D.SRC Year 4**

File Health Table Help

Resident  
 70 Years (Adult Resident)  
 30 Years (Adult Resident)  
 9 Years (Child Resident)  
Worker  
 40 Years (Adult Worker)  
 Standard Work Schedule (12.5% of 70 Years)  
 User Specified Years (Adult Worker)

Check the box at left if you want to include building downwash in the dispersion analysis. This will only be done for facilities that have building data stored in the database.

**Building Geometry**

Include building downwash in dispersion analysis

**Health Effect**

Cancer Risk  
 Chronic HHI  
 Chronic HHI Simple (Concurrent Max.)

**Multipathway**

Only  Multipathway Analysis (R)

**Source Categories**

Source categories to include  
 On-road mobile  
 Off-road mobile  
 Industrial/Large commercial  
 Small commercial  
 Dispersed  
 Total  
 All of the above

Define the tiles:  
Southwest corner: Grid spacing (m) 1000  
West (m) 70000 Num Tiles X 1  
South (m) 432000 Num Tiles Y 1  
Title (up to 16 characters, no blanks) Ventura  
Overwrite existing files  
Refresh Display Show only active records  
Activate Selected Records Deactivate Selected Records

**Sources in impact area [242 items]**

GEOID_STK	Category	Batch	Task	Active	GEOID
ONROAD_CALINE_VEN_25_PARTA	ONROAD	3	1	<input checked="" type="checkbox"/>	ONROAD_CALINE_VEN_25_PARTA
ONROAD_CALINE_VEN_25_PARTB	ONROAD	3	0	<input checked="" type="checkbox"/>	ONROAD_CALINE_VEN_25_PARTB
SCDS_UAM_EXONROAD_1603	ALL	2	2	<input checked="" type="checkbox"/>	SCDS_UAM_EXONROAD_1603
SCDS_UAM_ALL_1503	ALL	2	1	<input checked="" type="checkbox"/>	SCDS_UAM_ALL_1503
0201_56_SCC_VEN_1006_26	LARGE	1	111	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006
0201_56_SCC_VEN_1006_2	LARGE	1	111	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006
0201_56_SCC_VEN_1006_104	LARGE	1	104	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006
0201_56_SCC_VEN_1006_106	LARGE	1	106	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006
0201_56_SCC_VEN_1006_107	LARGE	1	107	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006
0201_56_SCC_VEN_1006_108	LARGE	1	108	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006
0201_56_SCC_VEN_1006_109	LARGE	1	109	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006
0201_56_SCC_VEN_1006_102	LARGE	1	102	<input checked="" type="checkbox"/>	0201_56_SCC_VEN_1006

## HARP Regional Data Integrator

batch processing of dispersion and risk on a large scale

## webHARP

Web-based interface to HARP analysis functions

**Test - Microsoft Internet Explorer**

File Edit View Favorites Tools Help

Address <http://www.dillinghamsoftware.com/webprojects/prototype2/Level3.aspx>

**Scenario (and exposure duration for cancer)**

Resident  
 70 Years (Adult Resident)  
 30 Years (Adult Resident)  
 9 Years (Child Resident)  
Worker  
 40 Years (Adult Worker)  
 Standard Work Schedule (12.5% of 70 Years)  
 User Specified Years (Adult Worker)

Check the box at left if you want to include building downwash in the dispersion analysis. This will only be done for facilities that have building data stored in the database.

**Building Geometry**

Include building downwash in dispersion analysis

**Health Effect**

Cancer Risk  
 Chronic HHI  
 Chronic HHI Simple (Concurrent Max.)

**Multipathway**

Only  Multipathway Analysis (R)

**Source Categories**

Source categories to include  
 On-road mobile  
 Off-road mobile  
 Industrial/Large commercial  
 Small commercial  
 Dispersed  
 Total  
 All of the above

**Regulatory Factors**

Include

**Microsoft Excel - HARPExpress10607\_5B.xls**

File Edit View Insert Format Tools Data Window Help Vsp

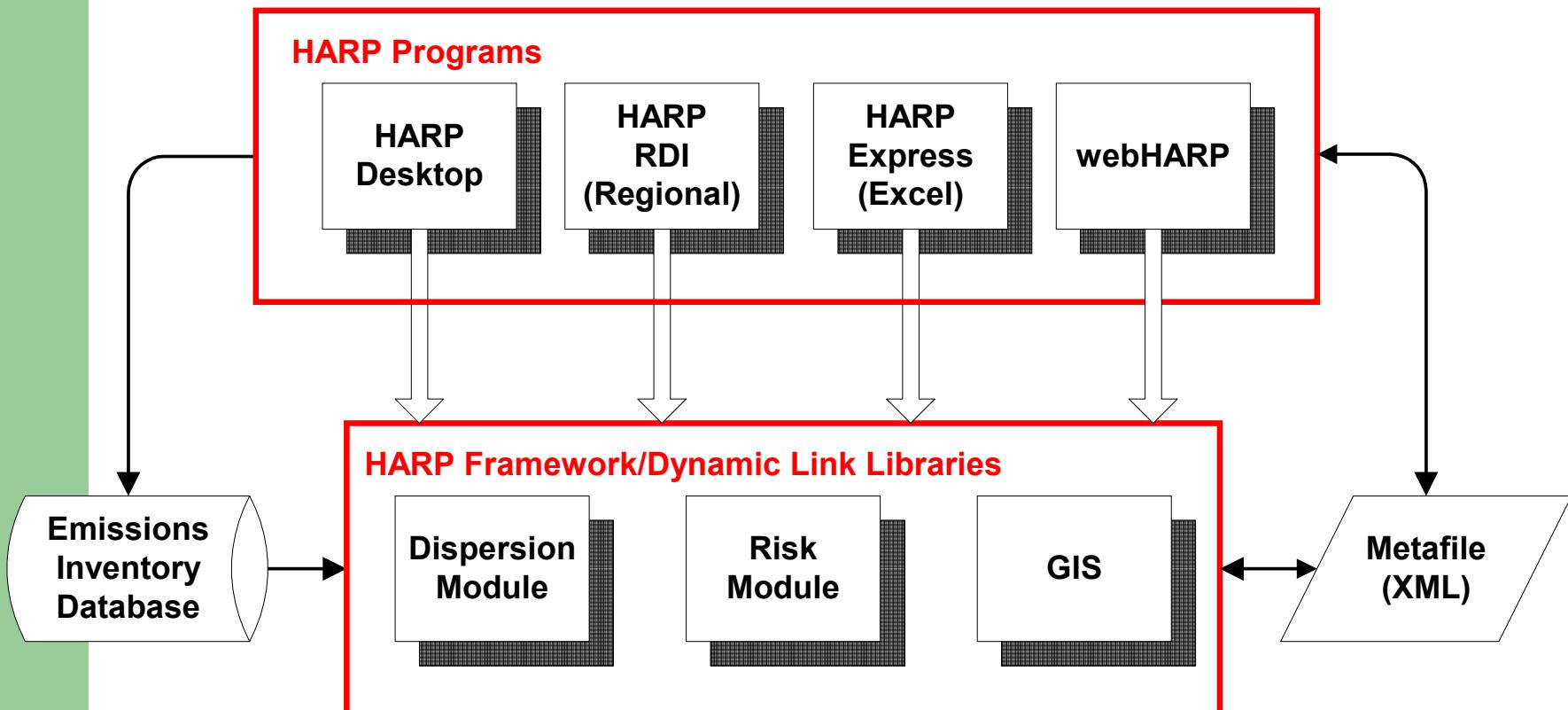
J28

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242

**Buildings and Stacks**

**HARP Express**  
Spreadsheet for streamlined input of data. Run HARP dispersion and risk analysis from Excel

# HARP Framework

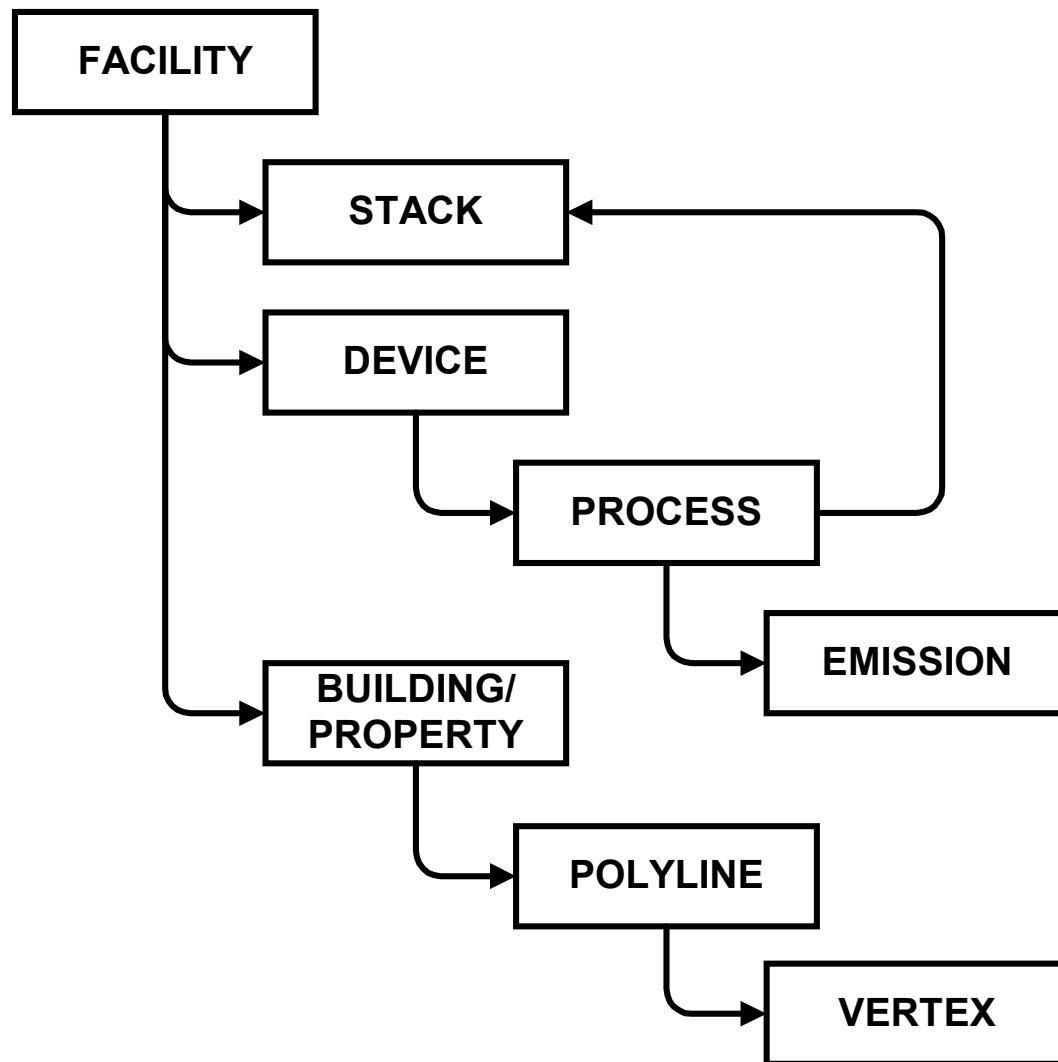




# Data Entry and Management

- **Interactive Data entry**
  - Facility, device, process, emissions, stacks, buildings, property boundaries
  - Error checking/validation
  - Pick-lists for pollutants, SCC, SIC, etc.
  - Conversion of facility and stack locations between coordinate systems and datums
- **Reporting**
  - Emission inventory standard reporting forms
  - Emission summary by facility and process
  - Q/A reports
  - Prioritization (ranks facilities based on California rules)
- **Read/write transaction files**
  - Allows exchange of data between consultants, facilities, districts, and state

# Database Organization



**Data editing windows.**

**Stack parameters**

**Press button to change coordinate systems**

**Release type**

HARP - Reporting Year 1998

Facility Data - Inventory Year 1998

Device Data - Inventory Year 1998

Process Data - Inventory Year 1998

Emissions Data - Inventory Year 1998

Stack Data - Inventory Year 1998

Add Duplicate Delete Save List Undo Next Previous Goto Help Exit

STACK INFORMATION

Page 1 | Page 2

Identification (1)

Facility	PROSPECT OIL	ID:	1001
Stack Name	PROSPECT STK 1		1

Release Parameters

Elevation (ft)	75	Temp (F)	200
Release Ht. (ft)	30	Rate (acf m)	753.9822
Stack Diam. (ft)	4	Vel. (fpm)	60

Calculate Rate      Calculate Vel.

Location

East	474.55	Datum	NAD27
North	3634.406	Coord. System	UTM
Units	km	Zone	11
		Spheroid	CLARKE1866

Change coordinate system

Locating Method

Release Type

Release Type:  Point  Volume  Area  Open Pit

Is default N

# Coordinate System Conversions



**Coordinate Conversion**

Accept Cancel

User Input Coordinates

East	474.2
North	3634
Units	km

Coordinate System

UTM Zone 10  
 UTM Zone 11  
 Teale Albers  
 Geodetic (Lat/Lon)

Datum

NAD27  
 NAD83  
 WGS84 (GPS WGS84 is approx. same as NAD83)

Other Coordinate Equivalents

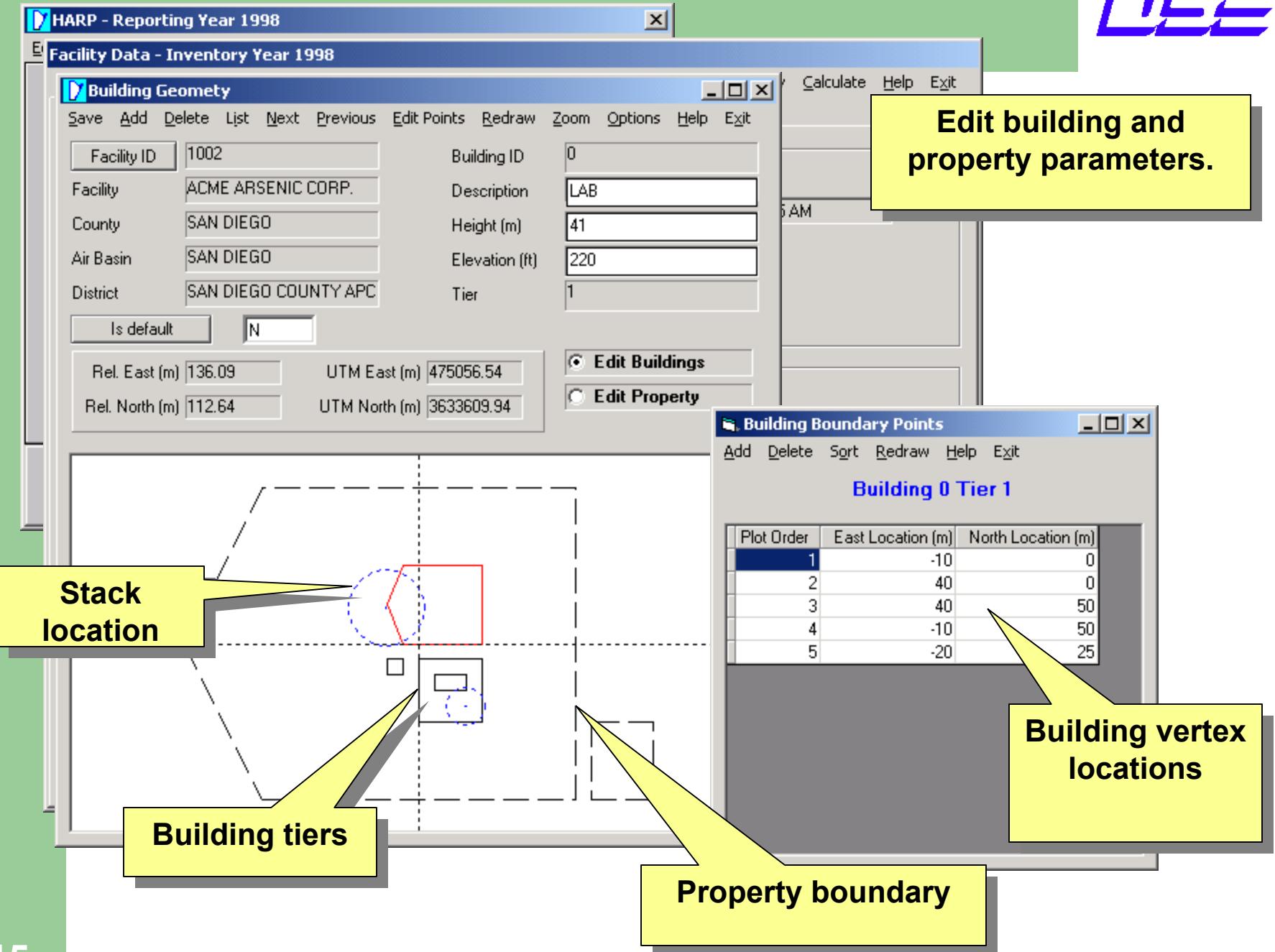
Update  Swap Zones

UTM	NAD 27	copy	NAD 83	copy	WGS 84
UTM East (km)	474.2		474.120447651825		474.1204476517
UTM North (km)	3634		3634.19730149625		3634.197301502
Zone	11		11		11

GEOGRAPHIC	NAD 27	copy	NAD 83	copy	WGS 84
Longitude (degrees)	-117.275695535876		-117.276554711042		-117.276554711042
Latitude (degrees)	32.8454789756813		32.845537477081		32.8455374762208

TEALE-ALBERS	NAD 27	copy	NAD 83	copy	WGS 84
East (m)	255331.976349979		255245.731743697		255245.731745209
North (m)	-570638.308623806		-570467.003749432		-570467.003754502

**Stacks and facilities can be entered in several coordinate systems and datums. All are converted to common system for analysis.**





# Reporting

# Q/A Reports



**Q/A Reports**

Print Exit

**Facilities**

All Facilities

Selected CO/AB/DIS

County

Air Basin

District

UTM Range

Min. North  East

Max.

Zone

User Defined Facility List

D:\HARP\HarpDev\CODE\HarpMain\facility.fac

Info

**Q/A Reports**

1 Facilities without emissions

2 Stacks without emissions

3 Devices without emissions

4 Processes without emissions

5 Stacks without processes

6 Emissions data Q/A

7 Stack data Q/A

8 Process and temporal data Q/A

**Select types of reports**

**Select which facilities**

# Emissions Reports



Facility Summary Report

Print Help Exit

**Chemical Group**

1 Aldehydes  
 2 Aromatics I  
 3 Aromatics II  
 4 Aromatics III  
 5 Organics I  
 6 Organics II  
 7 PAH Dioxins  
 8 Metals I  
 9 Metals II  
 10 Metals III  
 All reported substances  
 User Defined Chemical List

**Selected CO/AB/DIS**

County: 37  
Air Basin: SD  
District: SD  
Select CO/AB/DIS

**UTM Range**

North: \_\_\_\_\_  
East: \_\_\_\_\_  
Min.: \_\_\_\_\_  
Max.: \_\_\_\_\_  
Zone: \_\_\_\_\_

**User Defined Facility List**

Facilities List File: D:\HARP\HarpDev\code\HarpMain\facility.fac

Select which chemical groups to include in report

Select which facilities to include

You can define your own groups of chemicals or facilities and save them as lists

Chemical List File: D:\HARP\HarpDev\code\HarpMain\pollutnt.pol

# Emission Reports



**HARP - Reporting Year 1998**

Edit Data Reports Transactions Analysis Project Utilities Help Exit

**Facility Summary Report**

Print Help Exit

**Report**

Print Zoom Previous page Next page First Page Last Page Exit

1/1

REPORTS ANALYSIS AND REPORTING SYSTEM  
FACILITY SUMMARY - ALL REPORTED SUBSTANCES

01/06/03

FACILITY NAME	PSIC	ADDRESS	CITY	SIP	TOXIC SUBSTANCE	EMISSION ID	EMISSIONS (LBS/YR)
2001 AAA AUTO REPAIR		45678 COAST BLVD	LA JELLA		1382 Chromium, hexavalent (6 compounds)	12540299	0.200
1002 ACME ARSENIC CORP.		101 BLUEBIRD LN	LA JELLA		1382 [0] Arsenic compounds (inorganic)   Deleted/Obsolete Emiss	1015	1.000
3000 DILLINGHAM DONUTS		12345 COAST BLVD	LA JELLA		2383 Arsenic compounds (inorganic)	1016	10.000
1001 PROSPECT OIL					1382 [0] Arsenic compounds (inorganic)   Deleted/Obsolete Emiss	1015	15.000

**WYSIWYG preview window allows viewing, browsing and printing or reports.**

# Inventory Reporting Forms



**Inventory Report**

File Zoom Previous Page Next Page First Page Last Page

1/9

CALIFORNIA EMISSION INVENTORY DEVELOPMENT AND REPORTING SYSTEM II(CEIDARS II)  
REVIEW AND UPDATE REPORT - DATA BASE YEAR: 2  
FACILITY INFORMATION

COUNTY ID <input type="text" value="37"/>	AIR BASIN <input type="text" value="50"/>	DISTRICT ID <input type="text" value="50"/>	PERSON <input type="text"/>
FACILITY ID <input type="text" value="1002"/>	ACTION CODE <input type="text"/>	DATE <input type="text" value="04/2002"/>	INVENTORY YEAR <input type="text"/>
FACILITY NAME <input type="text" value="ACME ARSENIC CORP."/>			
ADDRESS <input type="text"/>			
CITY <input type="text"/>	ZIP <input type="text"/>	PHONE <input type="text"/>	
CONTACT PERSON <input type="text"/>	NUMBER OF EMPLOYEES <input type="text"/>		
FACILITY SIC <input type="text" value="1322"/>	UTM EAST <input type="text" value="475"/>	UTM NORTH <input type="text" value="28293"/>	
MAILING			
COMPANY NAME <input type="text"/>			
ADDRESS <input type="text" value="123 MAIN ST"/>			
CITY <input type="text"/>	STATE <input type="text" value="CA"/>	ZIP <input type="text"/>	
ATTENTION <input type="text"/>			
FACILITY CITY CODE <input type="text" value="450"/>	AIRSMOKER <input type="text" value="CO"/>	SUBCOUNTY ID <input type="text" value="NO2"/>	
AREA DESIGNATION <input type="text" value="CO"/>	<input type="text" value="NO2"/>	<input type="text" value="OZ"/>	<input type="text" value="PM"/>
<input type="text" value="SO2"/>	<input type="text" value="FORECASTID"/>	<input type="text" value="PRIORITY"/>	<input type="text" value="IN"/>
FACILITY PHASE <input type="text" value="DISTRICT USE"/>	<input type="text" value="FACD1"/>	<input type="text" value="FACD2"/>	

Prepared by Jeff Dillingham

**Standardized forms can be populated with current facility data, printed and mailed to facilities for updating and submission.**



# Dispersion Analysis

# Dispersion Analysis



- **Graphical User Interface**
  - Spreadsheet-like interface similar to Excel
- **Integrated**
  - Communicates with data management and risk analysis modules
- **Builds source input for ISC**
  - Extracts data from emissions inventory database
- **Builds receptor input for ISC**
  - Grids
  - Property boundaries
  - Sensitive receptors
  - Census blocks
  - Pathway receptors
- **Cumulative risk**
  - Handles multiple sources for cumulative risk
  - Assumes unit emission rate and computes GLC by post-processing

# Dispersion Analysis



- Building downwash
  - Automatic building downwash calculation using BPIP
  - BPIP has been converted into a DLL for speed
- Elevation lookup
  - Automatically determines elevations of sources and receptors from DEM data
  - DEM data is public domain
- Census block receptors
  - Public domain Census 2000 data is included
  - HARP automatically adds census block receptors to ISC input file for a user-specified geographic range

# Dispersion/Sources



Dispersion analysis window, source sheet

Grab a facility from the database and add all of its stacks to the dispersion run.

Selection Filter

Range (m)	3000	County
from		
UTME	474000	
UTMN	3634000	
UTM Zone	11	

Stacks to be included in the dispersion analysis appear in this list. Stack parameters can be edited here.

Source ID	Facility ID	Facility Name	County	Air Basin	District	Stack ID	Stack Name
S001	1001	PROSPEC	37	SD	SD	1	PROSPEC
S002	1002	ACME AR	37	SD	SD	1	ACME STA
S003	1002	ACME AR	37	SD	SD	1	SECOND STA
S004	2001	AAA AUTO	37	SD	SD	1	FIRST STA
S005	3000	DILLINGHAM	37	SD	SD	1	LAST STA

PitVol ( $\text{ft}^3$ )  
PARAMETER NAME: soPitvol  
Volume of OPENPIT source. Not used for dispersion analysis.  
ALLOWABLE VALUES: real, > 0, <= 10000

# Dispersion/Control Parameters



DISPERSION - C:\HARP\PROJECTS\DEMO\Demo.isc Year 4

File Analysis Control Options Utilities Help

ISC Files  
Control (highlighted with a red circle)  
Sources  
Grid Receptors  
Prop. Boundary  
Sensitive Recs.  
Census Blocks  
Pathway Rec.  
Meteorology  
Output  
Emission Rates  
Deposition and Depletion

**Pollutant**  
Pollutant ID: Other  
Half Life: -1

**Terrain**  
Terrain model: SIMPLE  
Elevated Receptors: Y  
Terrain Elevation Units: FEET

**Model Options**  
Use regulatory default: YES  
Rural or Urban: RURAL  
Gradual Plume Rise: NO  
Stack top downwash: YES  
Buoyancy induced dispersion: YES  
Calms processing: YES  
Missing data processing: NO

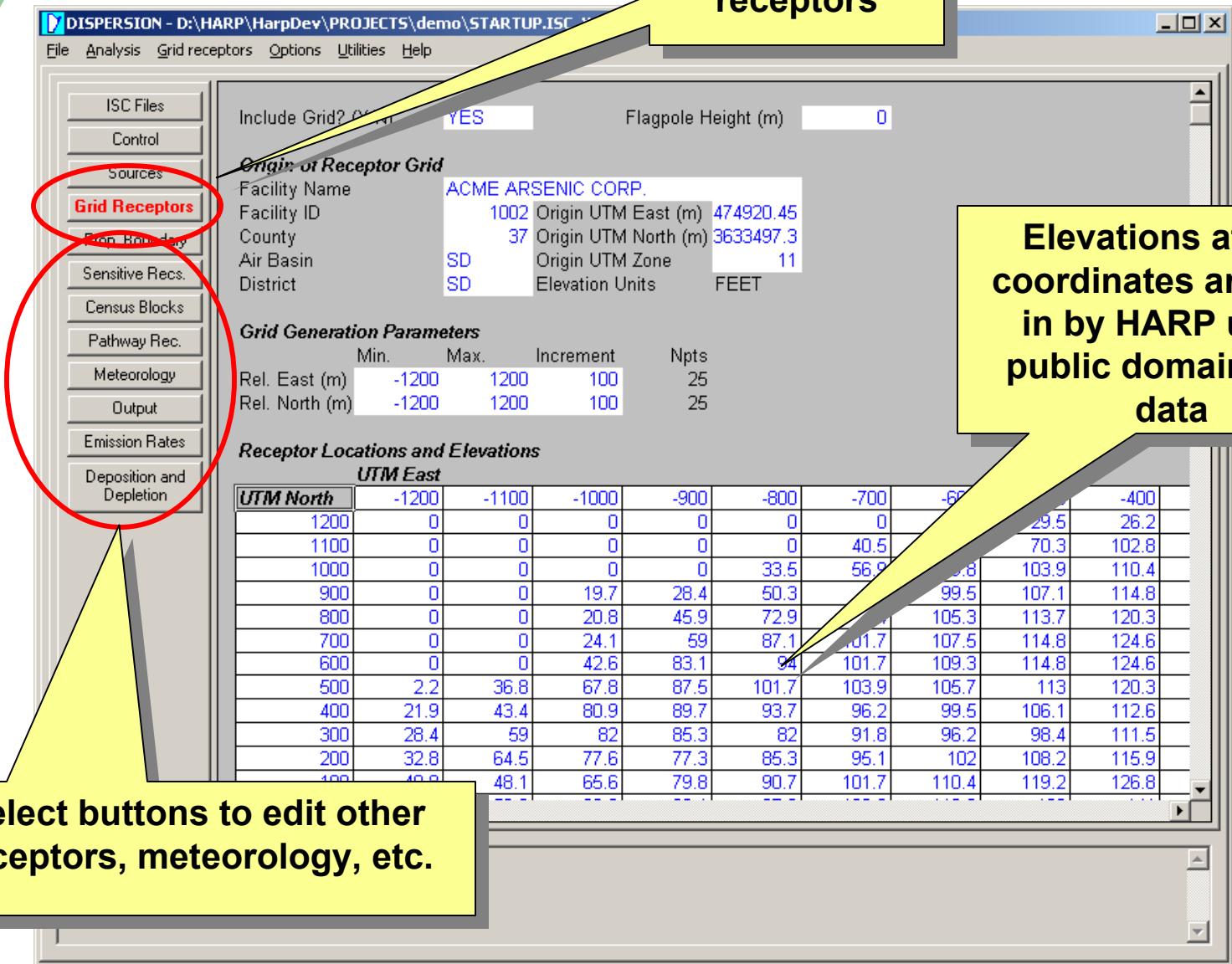
**Averaging times**  
1-Hour: YES  
3-Hour: NO  
8-Hour: NO  
24-Hour: NO  
Monthly: NO  
Period: YES  
Annual: NO

**Building Downwash**  
Include building downwash?: YES  
Lowbound Option?: NO

As you cursor around the worksheet, the help line describes the input parameter and cross-references the ISC manual.

NO  
PARAMETER NAME: LowBoundOption  
Enter "Y" to use the non-regulatory LowBound option for building downwash. This option only applies if "Include building downwash?" is set to "Y", otherwise it is ignored.

# Dispersion/Grid Receptors



# Dispersion/Pathway Receptors



DISPERSION - D:\HARP\HarpDev\PROJECTS\demo\pala.ISC Year 2

File Analysis Pathway Receptors Options Utilities Help test

ISC Files  
Control  
Sources  
Grid Receptors  
Prop. Boundary  
Sensitive Recs.  
Census Blocks  
**Pathway Rec.**  
Meteorology  
Output  
Emission Rates  
Deposition and Depletion

**Pathway Receptors**

Receptor ID	Receptor Name	UTM East (m)	UTM North (m)	Elevation (ft)	UTM Zone	Include?
WATER	WATER SOURCE	490600	3690000	1232.5	11	YES
PASTURE	PASTURE	490700	3690100	1149.9	11	YES
FISH	FISH	490800	3690200	1091.5	11	YES

Flagpole Ht. (m) 0

**Multipathway analysis defines three possible pathway receptors**

**The locations of pathway receptors determine the ground level concentrations at the places where the food, drinking water and fish are impacted. Some pathways, such as dermal, inhalation and home grown produce are only affected by the GLC at the target receptor.**

YES  
PARAMETER NAME: pastureInclude  
RESERVED FOR FUTURE USE.  
Enter Y to include pasture pathway receptor. Enter N if you do not intend



# Risk Analysis

# Risk Analysis



- **Multi-pathway**
  - Model follows OEHHA Guidelines; calculates cancer, chronic and acute risk
- **Point estimate or stochastic analysis**
  - Monte Carlo simulation
- **Optional “derived” risk**
  - Using dominant pathway approach (according to California rules)
- **Cumulative risk**
  - Risk from multiple sources and chemicals
- **Simplified or refined acute risk**
  - “Simplified” (concurrent max. approximation) acute risk is conservative and much quicker to calculate
- **Fully integrated**
  - Information flows transparently between database, dispersion analysis and risk analysis

- “What-if” analysis
  - User can modify chemical emissions and recalculate risk without rerunning dispersion model
- Chemical coefficients
  - Access database contains chemical-specific coefficients, pathways and toxicological endpoints. Chemical coefficients database developed and maintained by CARB and OEHHA.
- Adaptable network model architecture
  - User can inspect and/or modify any parameter or uptake distribution interactively. All equations and uptake factors are stored in external data files
- Averaging times
  - Automatically calculates averages, max. and hourly time-varying ground level concentrations at receptors for all chemicals from dispersion results and emission inventory. Five averaging times required for acute analysis.
- Cancer burden and population exposure
  - Census data is provided with HARP

# Risk Analysis



- PMI Report
  - Point of Maximum Impact
- Risk report options
  - Report by chemical, pathway, source and toxicological endpoint
- Contours
  - Calculates isopleths of cancer, chronic and acute risk and displays them on street map
- Street maps
  - Uses public-domain Tiger data
  - Tiger maps are converted to binary for speed and reduced storage

# Site Parameters



**Site Parameters (D:\HarpProjects\demo\project.sit)**

File Report Hide

Drinking Water | Fish | **Pasture** | Home Grown | Deposition |

Pasture pathway enabled

**Pasture water source**

Area ( $m^2$ )	1000
Volume (kg)	1.E7
Volume changes per year	1

The parameters on this page must be provided if the pasture pathway is enabled; otherwise these values are not used. If the pasture pathway is disabled then there will be no contribution to risk from contaminated products.

Cows are assumed to get their water from a pond that is located in the pasture. Enter the parameters for the pond.

Fraction of consumed beef from contaminated source

Enter the fraction of beef and dairy food consumed by the human receptor that comes from the contaminated pasture source.

Fraction of consumed dairy products from contaminated source

Fraction of beef cow drinking water from pasture water source

Enter the fraction of the beef and dairy cows' diet that comes from the contaminated pasture. Enter zero if the cows' drinking water is not contaminated.

Fraction of dairy cow drinking water from pasture water source

Fraction of cows feed from grazing

Cows are assumed to ingest grass, which is taken as a leafy vegetable grown at the pasture location. Feed other than pasture grass is assumed to be uncontaminated.

**Site parameters are required to define pollutant uptakes for multipathway analysis.**

**For example, these parameters define the geometry of the water body where the cows get drinking water.**

# Risk Analysis Options



**Risk Reports**

**Exposure duration, analysis method, health effect and site parameters define a “risk configuration”**

**Reports can be broken down by source, receptor, pathway and chemical**

**Exposure Duration**

- 70 year (adult resident)
- 30 year (adult resident)
- 9 year (child resident)
- 46 years (adult worker)
- Standard work schedule (12.5% of 70 years)
- User-specified years (adult worker)

**Analysis Method**

- Average Point Estimate
- High-end Point Estimate
- Derived
- Average, High-end and Derived

**Health Effect**

- Cancer Risk
- Chronic HHI
- Acute HHI (Screening)

Output file name:

**Receptors**

- All receptors
- Single receptor, enter number->

**Sources**

- All sources
- Single source, enter number

**Chemicals**

- All chemicals
- Single chemical, enter number

**Report Content**

- Report by source
- Report by receptor

Include breakdown by chemical  
 Include doses by pathway  
 Include site-specific parameter report  
 Include UTM

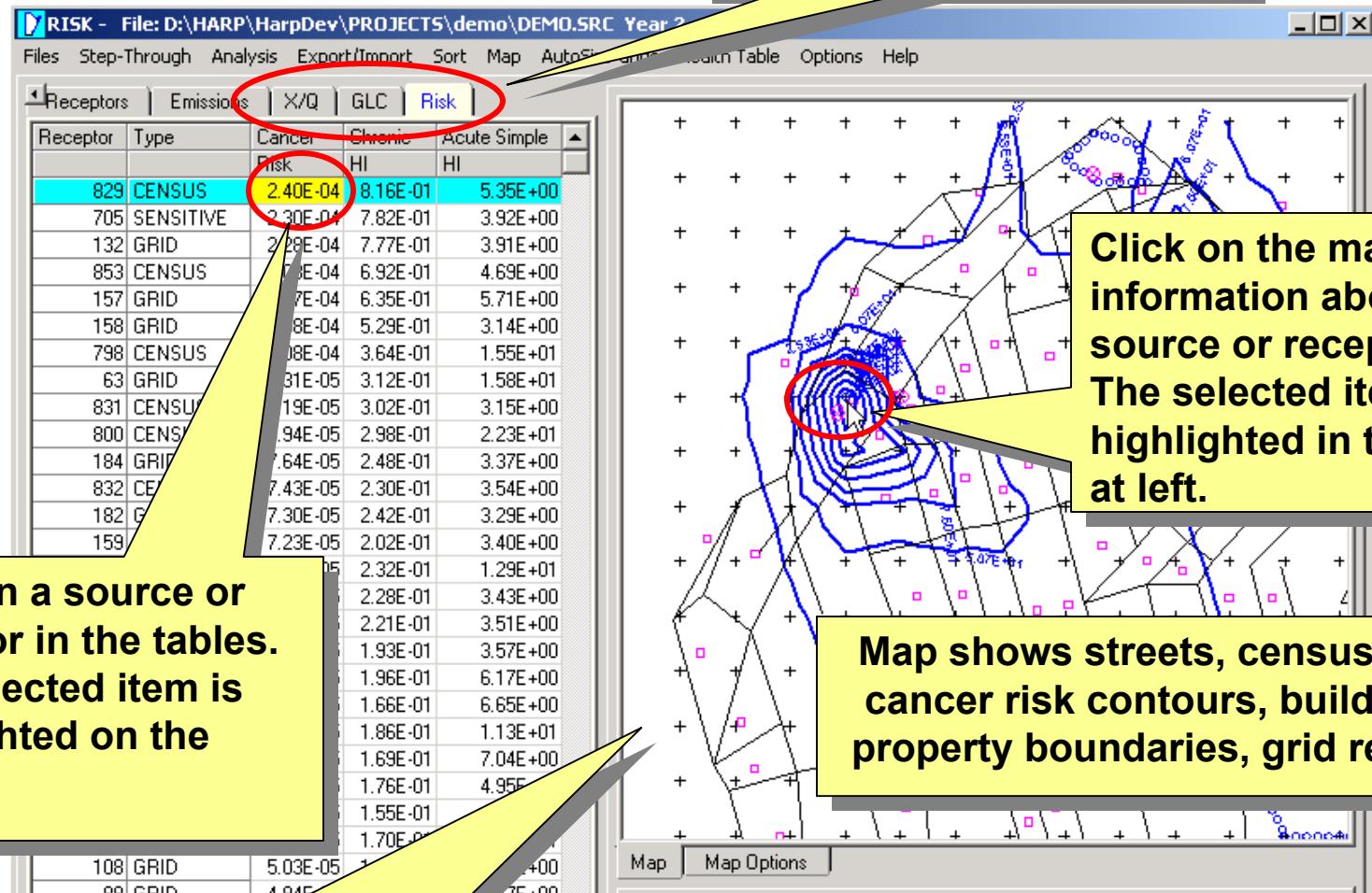
**Buttons:** Calculate, View Report, PMI/MEI, Site Parameters, Hide

Done. Report written to D:\HarpProjects\demo\Report.txt

# Risk Window



Dilution factors, GLC and risk are displayed in tables



Click on a source or receptor in the tables. The selected item is highlighted on the map.

Map can be printed or copied to Windows clipboard and pasted into a Word document

Click on the map to get information about a source or receptor. The selected item is highlighted in the table at left.

Map shows streets, census blocks, cancer risk contours, building and property boundaries, grid receptors

# Risk Analysis Step-Through



**Step-Through**

INSTRUCTIONS: follow the steps by selecting the buttons below in sequence. Read the description to determine if each step applies to what you want to do. After each step, return to this window by clicking on the task bar at the bottom of the screen, or selecting Step-Through from the main menu. Then proceed to the next step.

The notes in parentheses indicate how to invoke each action from the main menu.

Step 1 Open source-receptor file. Loads results from dispersion analysis.

Step 2 Define site-specific parameters. After selecting the Save button, run the dispersion analysis.

Step 3 Define screening assessment factors. Only do this if you have selected screening mode. (under Analysis menu)

Step 4 Select options for point estimate analysis. (Select Analysis/Point Estimate from the main Risk window menu). Repeat this step for cancer, chronic and acute, if applicable.

Cancer     Chronic     Acute  
 Standard Report Set (run Cancer, Chronic and Acute Reports in sequence without pausing)

Step 5 Create PMI/MEI report. (select Analysis/PMI/MEI from the menu)

Step 6 Contour results. This will display contours of the risk quantity that was calculated in Step 5. This requires that the dispersion analysis was done using a receptor grid. (select Analysis/Contour from the menu)

Step 7 Open street map file, if the streets are not already showing on the display. (select Files/Map File/Open Map File from the menu)

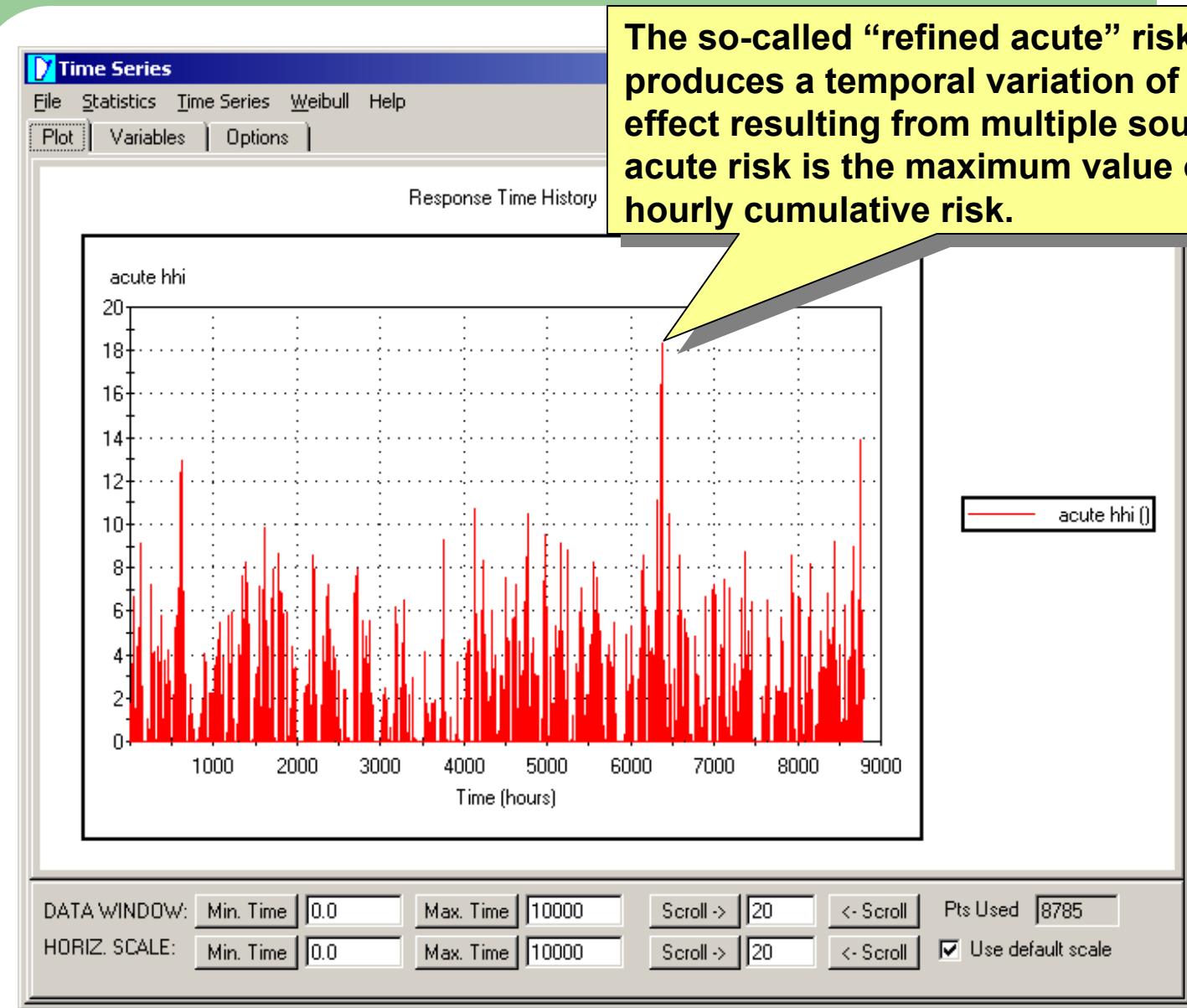
Step 8 Map print preview. From the preview window, select File/Print to print to printer, or File/Copy to Clipboard to copy to the Windows clipboard for pasting into a word processing program. (select Map/Preview from the main menu)

For further analysis options, including Stochastic Risk, Population Exposure Estimate (Cancer Burden), or Refined Max Hourly Risk, select the appropriate option from the Risk window Analysis menu.

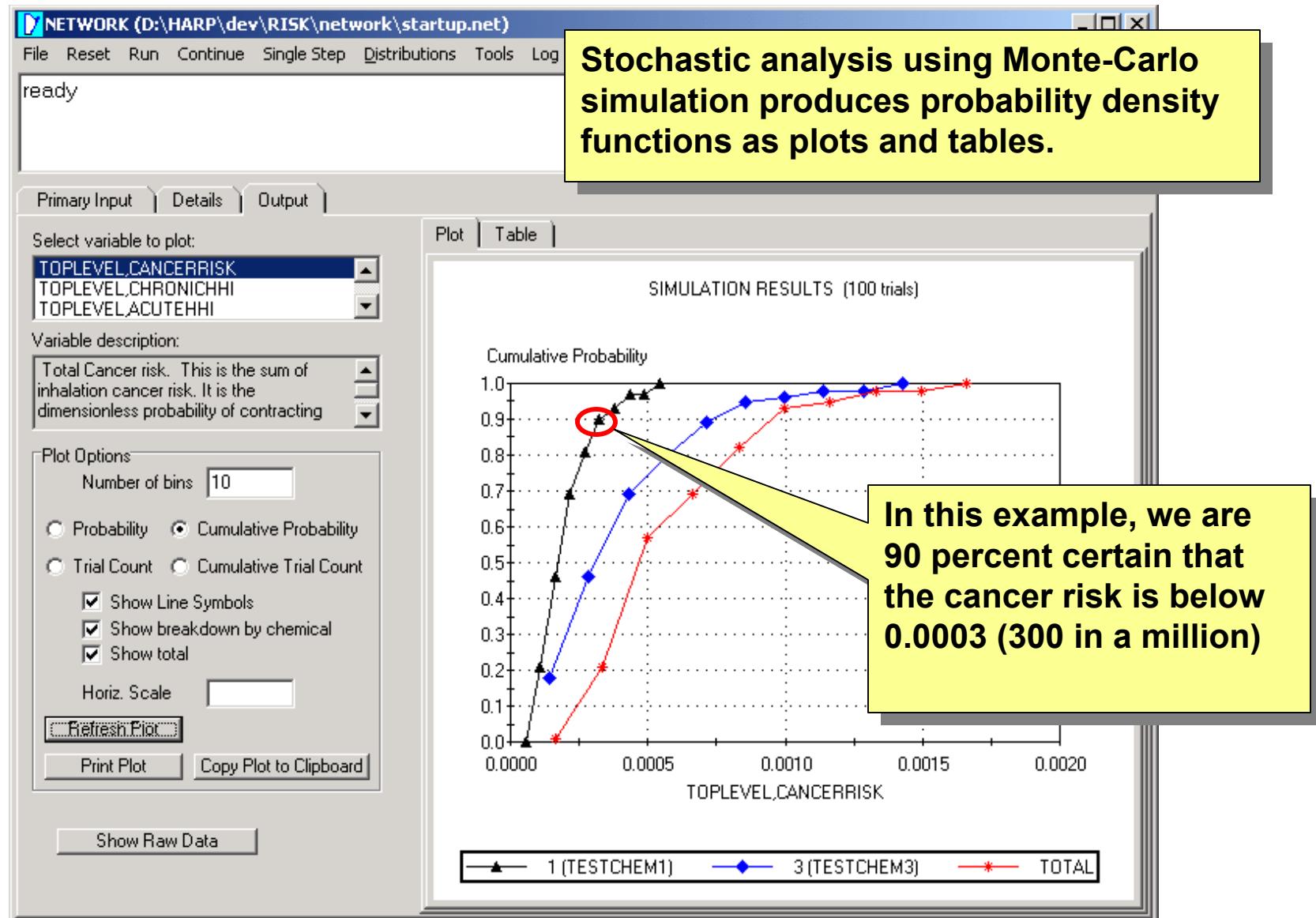
Show Risk Window

**For new users, the step-through window leads you through each of the basic steps of risk analysis in the correct order.**

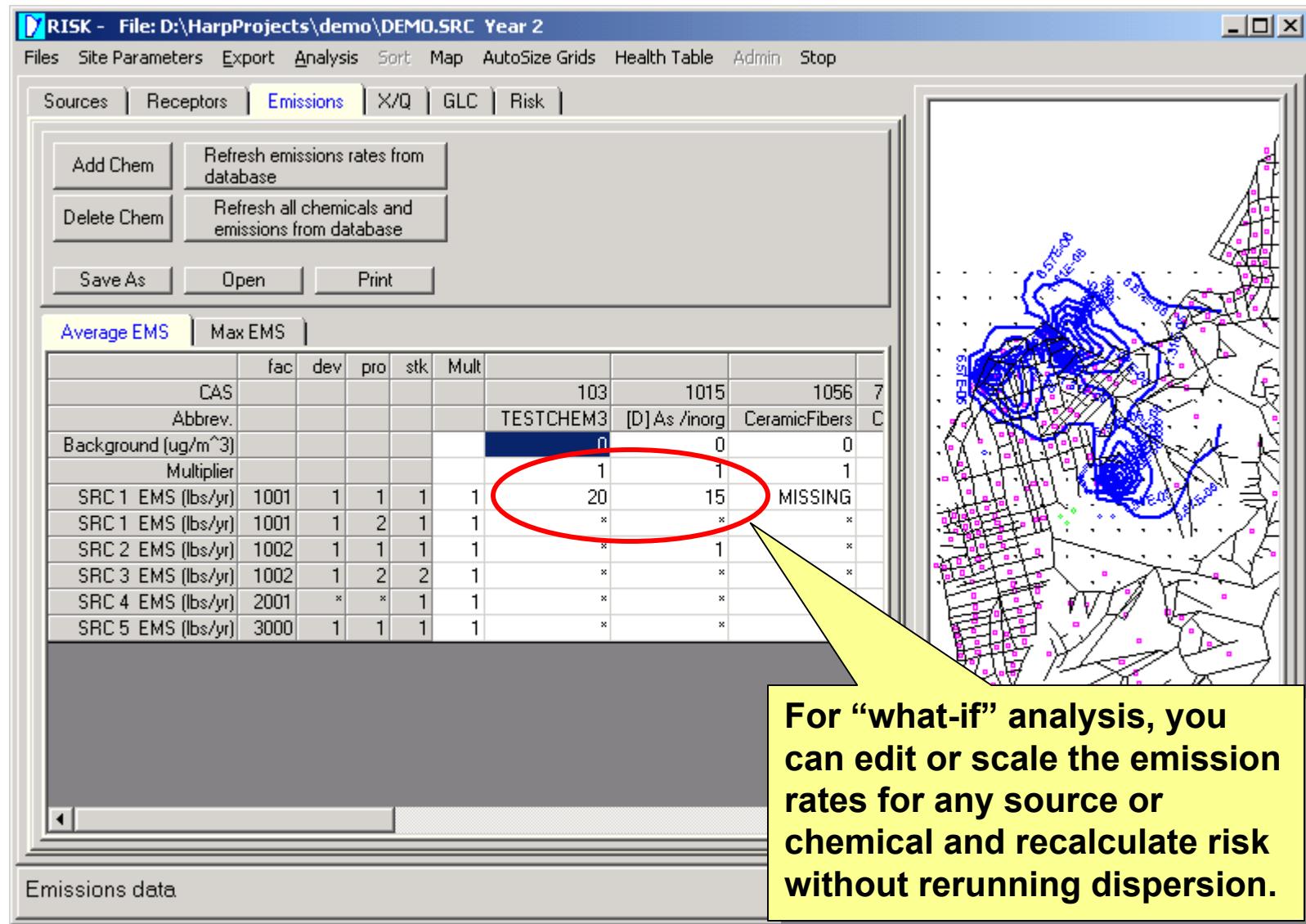
# Temporal Variation of Acute Risk



# Multipathway Stochastic Analysis



# Manual Override of Emission Rates



# Manual Override of GLCs



**Stochastic and Multipathway Details**

File Reports Export Run Site Parameters Distributions Tools Log

ready

Primary Input | Stochastic Output | Advanced (Network Details)

Scenario | **Chemicals** | Sampling |

Select Target Receptor and Update GLC Save Open

Add Chem Delete Chem << shift column left shift column right >>

Status: concentrations for receptor 209

CAS	103	1015	1056	7	102
Abbrev.	TESTCHEM3	[D] As /inorg	CeramicFibers	C	TESTCHEM As c
Multipathway?	Yes	Yes	No	Yes	No
GLC Average (ug/m^3)	0.000E+00	2.974E-03	0.000E+00	0.000E+00	5.948E-02
GLC Maximum (ug/m^3)	0.000E+00	1.783E+00	0.000E+00	0.000E+00	8.914E+02
GLC Drinking Water (ug/m^3)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
GLC Pasture (ug/m^3)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00
GLC Fish (ug/m^3)	0.000E+00	0.000E+00	0.000E+00	0.000E+00	0.000E+00

For a particular receptor, you have the option of manually entering the ground level concentration and recalculating risk.

# Multipathway Network Details



The multipathway network can be navigated in outline form

All multipathway parameters can be manually edited and saved, including uptake factors and probability distributions

The screenshot shows the DSEE software interface with the title bar 'NETWORK (D:\HARP\dev\RISK\network\start)' and menu bar 'File Reset Run Continue Single Step Distributions'. The main window has tabs 'Primary Input', 'Details', and 'Output' (selected). On the left is an outline view of the multipathway network structure under 'TOPOLEVEL (subnet)'. A red circle highlights this outline view. On the right is a 'Parameters' table with columns 'parameter name', 'type', 'source', 'value', and 'unit'. A red circle highlights this table. The table contains 14 rows of data, with row 1 ('TOPOLEVEL') being highlighted.

	parameter name	type	source	value	unit
1	TOPOLEVEL	SUBNET			
2	GLCTARGET	INPUT	EXTERNAL	1.0000	
3	GLCDRINKINGWATER	INPUT	EXTERNAL	1.0000	
4	GLCPASTURE	INPUT	EXTERNAL	1.0000	
5	GLCFISH	INPUT	EXTERNAL	1.0000	
6	EXPOSUREDURATION	CONTROL	EXTERNAL	70.0000	Years
7	ANALYSIS	CONTROL	EXTERNAL	CANCER	
8	WORKERRESIDENT	CONTROL	EXTERNAL	RESIDENT	
9	DISTRIBUTION	CONTROL	EXTERNAL	STOCHASTIC	
10	AGEGROUP	CONTROL	EXTERNAL	ADULT	
11	CAS	CONTROL	EXTERNAL	0.0000E+00	
12	CANCERRISK	OUTPUT	REF	(not set)	
13	CHRONICHHI	OUTPUT	REF	(not set)	
14	ACUTEULL	OUTPUT	REF	(not set)	

# PMI Report



FILE: D:\HARP\HarpDev\PROJECTS\demo\Rep_PMI.txt						
RECEPTORS WITH HIGHEST CANCER RISK						
REC	TYPE	CANCER	CHRONIC	ACUTE	UTME	UTMN
165	GRID	8.32E-05	2.41E-01	1.51E+01	474650	3634300
811	CENSUS	7.72E-05	2.23E-01	1.54E+01	474684	3634323
260	GRID	7.07E-05	2.17E-01	1.69E+00	474150	3633900
804	CENSUS	6.39E-05	1.85E-01	1.31E+01	474544	3634279
833	CENSUS	6.36E-05	1.93E-01	1.89E+00	474262	3633825
261	GRID	6.30E-05	1.87E-01	2.03E+00	474250	3633900
812	CENSUS	6.17E-05	1.77E-01	1.34E+01	474714	3634249
286	GRID	5.83E-05	1.76E-01	1.79E+00	474250	3633800
166	GRID	5.35E-05	1.53E-01	8.45E+00	474750	3634300
287	GRID	5.11E-05	1.42E-01	1.69E+00	474350	3633800
RECEPTORS WITH HIGHEST CHRONIC HHI						
REC	TYPE	CANCER	CHRONIC	ACUTE	UTME	UTMN
165	GRID	8.32E-05	2.41E-01	1.51E+01	474650	3634300
811	CENSUS	7.72E-05	2.23E-01	1.54E+01	474684	3634323
260	GRID	7.07E-05	2.17E-01	1.69E+00	474150	3633900
833	CENSUS	6.36E-05	1.93E-01	1.89E+00	474262	3633825
261	GRID	6.30E-05	1.87E-01	2.03E+00	474250	3633900
804	CENSUS	6.39E-05	1.85E-01	1.31E+01	474544	3634279
812	CENSUS	6.17E-05	1.77E-01	1.34E+01	474714	3634249
286	GRID	5.83E-05	1.76E-01	1.79E+00	474250	3633800
166	GRID	5.35E-05	1.53E-01	8.45E+00	474750	3634300
191	GRID	5.03E-05	1.44E-01	1.12E+01	474750	3634200
RECEPTORS WITH HIGHEST ACUTE HHI						
REC	TYPE	CANCER	CHRONIC	ACUTE	UTME	UTMN
811	CENSUS	7.72E-05	2.23E-01	1.54E+01	474684	3634323
165	GRID	8.32E-05	2.41E-01	1.51E+01	474650	3634300
812	CENSUS	6.17E-05	1.77E-01	1.34E+01	474714	3634249
804	CENSUS	6.39E-05	1.85E-01	1.31E+01	474544	3634279
191	GRID	5.03E-05	1.44E-01	1.12E+01	474750	3634200
189	GRID	4.82E-05	1.36E-01	1.01E+01	474550	3634200
820	CENSUS	3.79E-05	1.06E-01	1.01E+01	474591	3634107
89	GRID	3.24E-05	9.09E-02	9.63E+00	474550	3634600
192	GRID	4.19E-05	1.19E-01	9.54E+00	474850	3634200
813	CENSUS	3.99E-05	1.13E-01	9.49E+00	474793	3634130

**Point of Maximum Impact report. Receptors are sorted in descending order of cancer, chronic and acute risk.**

# Risk Report



Preview

Print Zoom Previous page Next page First Page Last Page Exit

2/5

CHEM	CAS	ABBREVIATION	POLLUTANT NAME
0001	103	TESTCHRM3	TESTCHEM3
0002	1015	[D] As /inorg	[D] Arsenic compounds (inorganic) [Deleted/Obsolete Emissent ID]
0003	1056	CeramicFibers	Ceramic fibers (man-made)
0004	7440439	Cadmium	Cadmium
0005	102	TESTCHRM2	TESTCHEM2
0006	1017	As cmpd(org)	Arsenic compounds (other than inorganic)
0007	101	TESTCHRM1	TESTCHEM1
0008	1016	As cmpd(inorg)	Arsenic compounds (inorganic)
0009	18540299	Cr (VI)	Chromium, hexavalent (& compounds)
0010	42401	SOX	Oxides of sulfur

CANCER RISK REPORT

RECEPTOR 165

SOURCE 1 DOSES BY PATHWAY (mg/kg)

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG
0001	9.57E-07	4.51E-09	1.40E-08	3.04E-08	1.04E-08	8.72E-07	1.10E-05	1.62E-08	1.08E-07	2.80E-10	1.06E-08	3.45E-10
0002	7.17E-07	2.17E-08	1.87E-07	0.00E+00	7.79E-09	6.54E-07	9.20E-06	1.35E-08	9.00E-08	8.28E-10	3.15E-08	1.02E-09
0003	0.00E+00											
0004	4.78E-10	3.62E-13	1.25E-10	0.00E+00	4.75E-10	4.36E-10	6.41E-09	1.47E-10	1.67E-11	1.53E-13	5.81E-12	1.89E-13
0005	1.43E-06	6.77E-09	1.86E-08	4.11E-08	1.56E-08	1.31E-06	1.47E-05	2.17E-08	1.45E-07	3.85E-10	1.45E-08	4.75E-10
0006	7.17E-08	0.00E+00										
0007	0.00E+00											
0008	0.00E+00											
0009	0.00E+00											
0010	0.00E+00											

SOURCE 1 RISK BY PATHWAY

CHEM	INHAL	DERM	SOIL	MOTHER	FISH	WATER	VEG	DAIRY	BEEF	CHICK	PIG	EGG	ME
0001	9.57E-08	4.51E-10	1.40E-09	3.04E-09	1.04E-09	8.72E-08	1.10E-05	1.62E-09	1.08E-08	2.80E-11	1.06E-09	3.45E-11	1.19E-09
0002	8.61E-06	3.26E-08	2.80E-07	0.00E+00	1.17E-08	9.81E-07	1.38E-05	2.03E-08	1.35E-07	1.24E-09	4.72E-08	1.53E-09	1.85E-09
0003	0.00E+00												
0004	7.17E-09	0.00E+00											
0005	1.43E-07	6.77E-10	1.86E-09	4.11E-09	1.56E-09	1.31E-07	1.47E-06	2.17E-09	1.45E-08	3.85E-11	1.45E-09	4.75E-11	1.60E-09
0006	0.00E+00												
0007	0.00E+00												
0008	0.00E+00												
0009	0.00E+00												
0010	0.00E+00												
SUM	8.86E-06	3.37E-08	2.83E-07	7.15E-09	1.43E-08	1.20E-06	1.64E-05	2.41E-08	1.60E-07	1.31E-09	4.97E-08	1.61E-09	2.13E-09

This example report shows risk broken down by pathway, chemical and source for a single receptor.

# Programmed Distributions

